Reprinted

FROM THE

TRANSACTIONS

OF THE

British Mycological Society.

1913.

WORCESTER:
EBENEZER BAYLIS & SON, STEAM PRINTERS, 22, THE CROSS,
AND TRINITY WORKS.

THE FRUIT-BODY MECHANISM OF BOLBITIUS.

By Professor A. H. R. Buller, D.Sc.,; Ph.D.; F.R.S.C.

In treating of the Hymenomycetes several writers have referred to the resemblances which exist between the genera Bolbitius and Coprinus. Thus Massee* says: "In the Ochrosporae, the genus Bolbitius agrees with Coprinus in the ephemeral existence of the species, in the soft deliquescent gills, and also in most frequently growing on dung or in places where dung abounds." Referring to Bolbitius the same writer† also says: "Very delicate and fragile, remarkable amongst the Ochrosporae for the gills dissolving into mucus, and in this respect analogous with Coprinus among the Melanosporae and Hiatula among the Leucosporae."

The genus Bolbitius was included by Hennings‡ along with Coprinus in the group Coprineae which was defined as follows: "Fruit-bodies with soft flesh (weich-fleischig), composed of an even web of hyphae, stipitate. Lamellae of different lengths, alternating in a regular manner. Hymenium composed of isolated protuberant basidia which are separated from one another in a regular manner by paraphyses. Lamellae and usually also the cap, deliquescent."

In previous publications, I§ have described the fruit-body

* G. Massee. British Fungus-Flora, Vol. I., 1892, p. 304.

† Ibid. Vol. II., 1893, p. 203.

‡ P. Hennings, in Engler and Prantl's Pflanzenfamilien, Teil 1, Abteil. 1**, 1897, p.204. The translation here given is mine.

§ A. H. R. Buller. Researches on Fungi; Longmans, Green & Co., London, 1909, chap. XIX.; also Annals of Botany, Vol. XXIV., 1910, pp. 613-629; and these Transactions, 1911, pp. 348-350.

mechanism of the Coprini. I showed that the so-called deliquescence is a process of autodigestion which plays an essential part in the liberation of the spores. In the genus Coprinus:

(1) The gills are very thin,
(2) The gills are parallel-sided or subparallel-sided.
(3) The gills are not positively geotropic.
(4) Usually the hymenium on one side of a gill at maturity looks slightly downwards, and that on the other side slightly upwards.
(5) The spores ripen in succession from below upwards on each gill.
(6) The spores are discharged in succession from below upwards on each gill.
(7) Autodigestion proceeds from below upwards on each gill and removes those parts of the gills which have become spore-free and which, if they continued in existence, would become mechanical hindrances to the fall of the remaining spores.

All the facts just given are correlated with one another. In the genus Coprinus the ripening and discharge of the spores from below upwards on each gill, and the autodigestion from below upwards on each gill are special arrangements which permit of successful spore-discharge from parallel-sided, non-geotropic gills.

After the fruit-body mechanism of Coprinus had been elucidated, it seemed to me advisable to investigate the fruit-bodies of a Bolbitius with a view to finding out whether or not their arrangements for producing and liberating spores were the same as in Coprinus. Accordingly, I examined the living fruit-bodies of *Bolbitius flavidus* Bolt,* obtained from a grassy field where horses had been grazing. This paper will be devoted to a brief statement of the results of my observations.

In the fruit-bodies of the Bolbitius I found that:

(1) The gills are very thin,
(2) The gills are not parallel-sided but are acutely wedge-shaped in cross-section.
(3) The gills are positively geotropic.
(4) Every part of the hymenium on any gill in a normally oriented fruit-body looks more or less downwards.
(5) The spores do not ripen in succession from below upwards on each gill.
(6) The spores are not discharged in succession from below upwards on each gill.

* My specimens resembled in appearance those of Plate 689 in Cooke's Illustrations. The fungus there represented, according to Massee, is *Bolbitius flavidus* Bolt. *Vide* his British Fungus-Flora, Vol. II., pp. 204 and 205.

(7) Autodigestion does not proceed from below upwards on each gill; it does not have any relation to spore-discharge but is a *post-mortem* change.

It is clear that the special mode of spore-production and spore-discharge which we find in Coprinus does not exist in Bolbitius. In particular the liquefaction of the gills which is such an essential feature of the fruit-body mechanism of Coprinus, has nothing to do with spore-discharge in Bolbitius. In Coprinus the autodigestion takes place whilst the pileus is still actively shedding spores, whereas in Bolbitius the turning of the pileus into a brown mucus takes place when spore-discharge has ceased and the whole pileus is exhausted and dead.

The fruit-body mechanism of Bolbitius resembles in its main features that of a Mushroom. The gills are wedge-shaped in cross-section and are positively geotropic. This ensures that in a normally oriented fruit-body every part of the hymenium looks more or less downwards. Correlated with this fact we find that every small area of the hymenium (every square mm.) produces and liberates spores at one and the same time. On any one small area, a series of basidia ripen and shed their spores in succession.

From the fore-going remarks we may conclude that the arrangements for spore-production and spore-liberation in Bolbitius are essentially different from those of Coprinus.

The hymenium on the sides of the gills of Coprinus consist of:

(1) Basidia which are dimorphic: long basidia and short are interspersed among one another.

(2) Large and well-developed paraphyses which form a continuous system and which separate the basidia from one another.

(3) Large cystidia, present in some species but absent in others.

The hymenium on the sides of the gills of the Bolbitius consist of:

(1) Basidia which are monomorphic: the basidia are all of the same length and cannot be divided into two sets, long and short.

(2) Large and well-developed paraphyses which form a continuous system and which separate the basidia from one another.

(3) Cystidia are absent.

Coprinus and Bolbitius have very similar paraphyses which are remarkable for their high development. On the other hand the two genera differ markedly in their basidia. The dimorphism which we find in Coprinus is absent in Bolbitius. Further, on any very small area of the hymenium of Coprinus at maturity, all the basidia have full-sized and practically ripe spores on them at

one and the same time. On a similar area of the hymenium of Bolbitius, adjacent basidia are not in about the same state of development at any one time. Here the basidia develop and discharge their spores in succession.

In their general field characteristics the Bolbitii do bear a general resemblance to the Coprini. Among these characteristics may be mentioned:

(1) Thin flesh and relatively large gills.
(2) Relatively long stipes.
(3) Delicacy and ephemeral nature of the fruit-bodies.
(4) Deliquescence of the gills and pileus flesh.
(5) Fruit-bodies coprophilous.

However, if instead of merely considering the more obvious characters we study the whole organization of the fruit-bodies, taking into account both microscopic and macroscopic characters, then I think we must conclude that the two genera stand far apart. Their fruit-body mechanisms for the production and liberation of spores are essentially different, and one could not be converted into the other without important structural and physiological changes.